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ABSTRACT

This guide describes practical methods for testing and teaching handicapped children and youth, in either segregated or integrated classrooms, with the focus on developing countries. The first chapter discusses: features of a suitable curriculum; use of a task importance rating scale; and curriculum content, including home environment tasks, community environment tasks, vocational tasks, and tasks common to all environments. A chapter on testing addresses criterion-referenced tests and norm-referenced tests, examines methods of adopting existing tests and curricula, and gives examples of some tests and curricula. The final chapter describes methods of instruction, such as sequential group instruction, concurrent group instruction, and individual instruction, and discusses the use of prompts, modelling, task analysis, shaping, rewards, and practice. (JDD)

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**Testing and Teaching
Handicapped Children
and Youth
in Developing Countries**

David Baine, Ed.D.

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Guides for Special Education No. 3

Testing and Teaching
Handicapped Children
and Youth
in Developing Countries

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Unesco, 1986

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PREFACE

This guide is the third in the new series 'Guides for Special Education' published by Unesco.

The guides, which are intended for teachers, parents and community workers, aim at stimulating discussion on basic knowledge, methods and techniques relevant to the education of handicapped persons, and offer practical advice for action in this domaine.

This guide deals with basic principles and methods of testing and teaching handicapped children. It addresses itself primarily to teachers and could be considered as a supplement to Guide I 'The Education of Children and Young People who are Mentally Handicapped'. References to tests and curricula are given in the text of Chapter II.

The views expressed in the guide are those of the author and do not necessarily reflect those of Unesco.

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INTRODUCTION

PURPOSE

This guide describes practical methods of testing and teaching handicapped children and youth. The methods are useful for most types and ages of handicapped students. Many of the methods are also suitable for non-handicapped students. The methods may be used in segregated or integrated classrooms. Group and individual methods of instruction are described.

The guide is designed for teachers with little or no specialized training. However, the task of learning to apply all of these methods may initially appear large and difficult. The following suggestions are made to help teachers learn the methods in an effective manner.

Suggestions for learning the methods described in this teachers' guide

Suggestions for teachers working alone

1. Learn one method at a time.
2. Try the method with one or two students.
3. Use the method to teach only one or two skills.
4. Learn to use the method well before using it with more students and skills.
5. Learn the method well before learning new methods.

Suggestions for teachers working with other teachers

1. Two or three teachers may learn a single method at the same time.
2. When trying the method, teachers should alternate playing the role of either the student or the teacher.
3. Teachers playing the role of students should make the same types of mistakes as students usually do.
4. When each teacher has learned to use the method well, they may begin to use the method with a student.

5. When a teacher is teaching a student, another teacher may watch and evaluate use of the method.
6. Later, the teachers can discuss any problems that arose.
7. During the discussion, it is important to be positive. Focus most of the discussion on specific things that the teacher did well.
8. The teacher may wish to practice the method again with another teacher before returning to the student.
9. While one group of two or three teachers is learning to use one method, another small group of teachers may be learning to use another method.
10. When both groups have learned to use their methods well, the teachers in each group may teach the method they have learned to the teachers in the other group.
11. As each teacher is learning the second method, he or she will continue to practice the first method learned as it is taught to the other teacher. This practice will help both teachers make their skills into strong habits.
12. When a teacher is practicing a newly learned skill, a teacher from another team who knows the method well should watch and evaluate use of the method.
13. Steps 6, 7 and 8 may be repeated.

CHAPTER ONE

THE CURRICULUM

A suitable curriculum for handicapped students should have the following features.

1. Ecological validity: the curriculum must teach skills that are required in the environments in which students live now and in which they will likely live in future. Different skills are required of students living in village or city environments. Many of the skills required in one village may be different from those required in another village. In fact, many of the skills required of students living in one part of a city may be quite different from those required of students living in other parts of the same city. Many different skills are required in slum and wealthy areas of a city. The curriculum must also teach the skills required of students in transition from one type of environment to another, for example, from village to city.

2. Normalization: curricula must teach skills that will help students to lead lives that are as close as possible to the lives led by non-handicapped people. Students must be taught skills that will permit them to perform as independently as possible in the least restrictive environments in all areas of their lives. A least restrictive environment is one that is as close as possible to that in which non-handicapped people of the same chronological age generally perform. The curriculum must teach skills that will permit each student to integrate as much as possible with non-handicapped persons.

3. Instructional validity: the curriculum must teach functional skills. Functional skills are those that students require to live as independently, as age-appropriately and in a manner that is at least restricted as possible, now and in the future. The curriculum must also teach all of the skills that are prerequisite to learning each functional skill. An efficient curriculum should not include any skills that are not either functional or prerequisite to functional skills.

Ecological inventory

An ecological inventory is a method of developing curricula that have all of the features listed above. The inventory is also used to develop criterion referenced tests (described in the next chapter). Tests and curricula developed by ecological inventories represent the ideal. In some situations, many of these methods

may be readily adopted. In other situations the ideal may be difficult to achieve. In this case the ideal may represent a long-term goal to work toward. Methods of working toward the ideal are described later in this chapter.

The steps performed in an ecological inventory are as follows (these methods are adapted from Brown et al. 1979).

1. A target group of students is identified. A target group is a particular group of student for whom a curriculum or test is being developed. The target group is defined in terms of age, type of handicap, level of functioning and location (e.g., village or city). For example, separate ecological inventories would be required for: (a) children ages one month to three years; four-six years, etc.; (b) students with mild or severe mental retardation and (c) students living in villages, cities, poor or prosperous.

2. A survey is made of the home, community, school and vocational environments in which each student lives.

3. In each environment the subenvironments in which members of the target group are currently performing are identified. Also identified are the least restrictive environments in which the handicapped students could learn to perform in future. Least restrictive environments are as close as possible to those in which non-handicapped people of the same chronological age generally perform. For example, in a village community environment, subenvironments may include the fields where crops are grown, the village well, the market, the temple and the river where fish are caught.

Usually, when predicting future environments, it will be sufficient to predict where students will be in one year, except where: (a) major environmental changes are predicted such as movements from rural to urban areas or (b) where a large number of skills are required and/or (c) where the skills required may take a long time to acquire, for example, vocational skills. In these cases, depending on the learning ability of the students in the target group, it may be desirable to predict where the students will be in three-five years.

4. The tasks in each subenvironment are then listed. For example, at the village well, tasks may include bathing (self or others), washing clothing, washing cooking equipment, and getting drinking and cooking water.

The analysis of subenvironments and tasks is performed through direct observation of behaviour in situations in which handicapped and non-handicapped students usually perform. In addition, parents and teachers may be interviewed to determine where, when and how students perform various tasks.

It may be wise to conduct the first inventory on the largest target group of handicapped students. The results of this first analysis will be useful to the largest number of students. Also, the largest group of students with handicaps will likely have the most similarities with other groups of handicapped students. As a result, the information from the first analysis will assist the analysis of other groups of handicapped students.

Before beginning a large analysis, it may be wise to conduct a limited study with a small number of students in a familiar environment such as the home. The analysis may be expanded to other environments and students following the development of efficient procedures.

To develop curricula that teach skills that are chronologically age-appropriate and that permit students to perform in the least restricted environments, ecological inventories are conducted of both handicapped and non-handicapped students of the same chronological age. Functional tasks performed by non-handicapped students, that handicapped students could perform as a result of instruction or prosthetic (mechanical, electrical, sensory, motor or cognitive) assistance may be included in the curriculum.

This part of the analysis may be most efficiently conducted by following the steps listed below.

- (a) Define the target group of students as described above.
- (b) Identify a broad variety of different types of families that have at least one handicapped child from the target group and at least one other non-handicapped child of the same sex and similar chronological age.
- (c) Perform an ecological inventory on both the handicapped and non-handicapped children in each family; study both current and future environments and skills as described above.
- (d) Identify those functional tasks performed by the non-handicapped children that it is likely handicapped children could perform with prosthetic assistance or instruction.
- (e) Follow the steps listed below to decide if these tasks should be included in the curriculum being designed for students in the target group. The major steps involved in the development of criterion referenced, task analysed tests and curricula is continued in the next chapter.

5. The tasks (for both handicapped and non-handicapped students) within each environment are listed according to their relative importance. On the following scale, rate the relative importance of each task by circling either 0, 1 or 2 for each item. As each task is rated, find the total of all the circled numbers. The task with the highest number may be the most important task for the student to learn.

(Technical note: the 0, 1 and 2 weighting for each item is arbitrary. Perhaps for some items, students or environments, the weighting should be higher or lower. For example, the weights for 'survival skills' may be increased to 0, 3 and 5. As it is, the scale may help initial decisions. With experience, the weights may be changed to better suit local circumstances.)

Task importance rating scale

	n	s	a
The importance of each task	o	o	
may be judged by its likely	n	m	1
contribution to:	e	e	o
		t	
(a) learning functional skills;	0	1	2
(b) increasing social acceptability;	0	1	2
(c) learning chronological age-appropriate skills.	0	1	2
(d) learning additional skills;	0	1	2
(e) learning survival skills;	0	1	2
(f) improving performance in a variety of environments;	0	1	2
(g) increasing opportunities to interact in a variety of environments;	0	1	2
(h) increased opportunities to interact with non-handicapped peers;	0	1	2
(i) increased ability to fulfill frequent task demands;	0	1	2
(j) increased ability to perform in less restrictive environments;	0	1	2
(k) improved health.	0	1	2

6. In the final stage of the inventory, the steps required to perform each task are listed. These steps are identified through task analysis. Task analysis involves breaking down a task into the sequence of individual steps a student must learn in order to perform a task. A task analysis may be done by: (a) studying the steps other people take to perform the task, (b) thinking-through each of the steps in a familiar task, and/or (c) performing the task. It is best to study the manner in which several competent

people perform a task to find the simplest way to perform the task. Also, by studying the way that people who are having difficulty perform a task, a teacher can identify problems to avoid during teaching.

The results of a task analysis of 'getting drinking and cooking water from a well' are listed below:

- (a) carrying an empty water jar to the well;
- (b) waiting one's turn to use the well;
- (c) holding the water jar;
- (d) putting the jar on level ground near the well;
- (e) dropping a bucket on a rope into the well;
- (f) pulling the rope to raise the bucket filled with water;
- (g) using the water to clean the water jar;
- (h) filling the water jar with the bucket;
- (i) carrying the filled water jar home.

This list of steps would be put into the curriculum for students living in villages in which getting water from a bucket well is required. Functional, ecologically valid curriculum is built by listing each of the steps required to perform each of the important tasks in a student's current and future environments.

Curriculum content

What skills should be in a curriculum for handicapped students? During an ecological inventory a survey is made of the tasks performed in home, community, school and vocational environments in which the students in the target group live. The tasks are listed according to their relative importance. These tasks are then task analysed to identify what specific skills to teach. These skills relate to a great variety of functional tasks in various environments. Some of the tasks that might be included in a curriculum designed for handicapped students living in a village are listed below. The list is not complete. The list does not apply to all villages. Note that some of the skills are used in only one environment. Other skills may be used in two, three or four environments.

Home environment tasks

Kitchen subenvironment

- (a) using charcoal, wood or dung in a fire;
- (b) washing, peeling and cutting vegetables and fruit;
- (c) measuring, washing and cooking rice, lentils, and corn;
- (d) preparing and using spices;
- (e) cleaning fish;
- (f) storing food and water.

Toilet subenvironment

- (a) toileting;
- (b) cleaning teeth;
- (c) washing body;
- (d) washing and combing hair;
- (e) caring for menstrual needs;
- (f) shaving;
- (g) caring for infections, cuts and bites.

Community environment tasks

Market subenvironment

- (a) locating market stalls for fruits, vegetables, grains and meats;
- (b) selecting the correct food item (e.g. selecting a specific type of vegetable);
- (c) selecting mature, undamaged food;
- (d) agreeing on the price;
- (e) paying for the food.

Temple, church, or mosque subenvironments

- (a) preparing for entry into the holy place;
- (b) making sacrificial offerings;
- (c) praying;
- (e) participating in weddings, funerals and other special ceremonies;
- (f) behaving appropriately toward holy people.

Playing field and river area

- (a) swimming, running;
- (b) observing water safety;
- (c) playing ball games.

Community meeting area

- (a) performing cultural dances;
- (b) playing musical instruments;
- (c) singing.

Vocational environment tasks

Animal shed subenvironment

- (a) putting animals in the shelter;
- (b) sweeping the cattle shed;
- (c) carrying cow dung to the manure dump;

- (d) collecting fodder for the cows and buffaloes;
- (e) milking the cows, and goats;
- (f) caring for cuts, scrapes and infections.

Field subenvironment

- (a) plowing and cultivating the field;
- (b) spreading fertilizer;
- (c) planting seeds;
- (d) building and maintaining irrigation ditches;
- (e) watering the crop;
- (f) removing weeds;
- (g) picking and storing the crop;
- (h) grazing goats and sheep;
- (i) collecting firewood.

Workshop subenvironment (e.g. blacksmith shop)

- (a) collecting firewood and coal;
- (b) lighting a fire;
- (c) adding firewood and coal to fire as required;
- (d) using tongs to insert and remove iron from fire;
- (e) judging temperature of iron in the fire;
- (f) using a hammer and anvil to shape a piece of hot iron in a desired manner.

Tasks common to all environments

- (a) social behaviour: verbal: conversations, greetings, requests, etc. (may include sign language and speech reading); emotional: control and expression;
- (b) responding to emergencies: fires, cuts, bites, scrapes, and water accidents;
- (c) discriminating edible from non-edible things;
- (d) drinking 'safe' fluids and eating 'safe' foods;
- (e) protecting self against poisonous insects and animals (snakes, scorpions).

No tasks have been listed for school environments. Some of the subenvironments in schools are the bathroom, stairs and hallways, eating area, play area and the classroom. The intent is not to eliminate academic study from the curriculum but to change the academic focus of most curriculums for handicapped students. Usually, in the past, curriculums for handicapped children have been organized in the following ways.

Pre-school, early school and severely handicapped students

Self-help, communication, gross and fine motor, cognitive (pre-academic or readiness), sensory, social and perceptual.

Older or higher functioning students

Arithmetic, reading (literature), language (writing, communication), history, geography, science, health and community living, arts and crafts, physical education, music, vocational.

Students with special handicaps

Speech reading, sign language and speech training for hearing impaired students.

Orientation, mobility and Braille for visually impaired students.

In the past these curricula have focused mainly on teaching academic or pre-academic skills. Often students have been given standard school curricula that they follow at a slower rate than do non-handicapped students. Recently, special curricula have been developed but they also tend to focus on academic and pre-academic tasks in addition to developmental tasks appropriate to students of younger chronological age levels.

Several problems arise with curricula of this type.

1. Some students never learn to read, write or do arithmetic well enough to use these skills in a functional way. Many hours are spent teaching some students skills they cannot master and cannot use. This daily experience of failing to teach and failing to learn is very difficult for both teachers and students.

Because most of the students' time is taken trying to learn academic skills, little or no time is available to teach functional skills the students require in their everyday lives. As a result, the students are unsuccessful in all areas of life.

2. Some handicapped students do learn to perform some academic or pre-academic skills. Unfortunately, the classroom conditions in which the student learn these skills are different from the conditions in the natural environment in which the students must eventually perform the skills. Failure to generalize learning from the classroom to the natural environment is one of the major problems found when teaching handicapped students. Failure to generalize occurs when a student learns a skill in one situation but cannot perform the skill in another situation. For example, a student may learn to sort colour cards in the classroom but be unable to distinguish immature from ripe fruit on the basis of colour. The ability to distinguish red, green and blue on colour cards may not generalize to the selection of fruit because of:

- (a) the difference in format (no colour cards were used in the discrimination of the fruit);
- (b) slight differences between the colours of the cards and the colours of the fruit (the red fruit may have been a yellow-red); or
- (c) the failure to teach the learner the functional skill of choosing ripe fruit on the basis of colour.

Frequently, curricula that focus on teaching academics fail to give students enough practice under the variety of situations that occur in the natural environments. For example, to make colour discrimination a functional skill, one would not teach a student to sort colour cards (people are usually not required to sort colour cards in the natural environment). Instead the student would be taught to sort fruit and other objects that she or he will be required to sort on the basis of colour. Sorting colour cards is not a functional skill. Sorting fruit on the basis of colour is a functional skill. When a student is taught to sort colour cards the skill must transfer to a functional skill like sorting fruit. When a student is directly taught to sort fruit on the basis of colour, the student has been taught both how to sort colours and how to sort fruit on the basis of colour.

Problems with generalization to some extent affect all students. Problems with generalization increase as the level of intellectual functioning of the students decreases. Wherever possible, teach functional skills directly in the form in which they must be performed in the natural environment. Teaching skills in the natural environment is called in situ teaching. In situ teaching avoids many of the problems associated with generalization.

The intent is not to remove academics from the curriculum. Some handicapped students, particularly those who have visual, auditory or physical impairments may be able to achieve high academic levels including university. Some mentally retarded students may also be able to learn some very useful academic skills.

1. All handicapped students should be given the opportunity to learn the academic skills they are able to learn and that they will be able to use.

2. Ecological inventories should be done for all handicapped students to determine what academic skills they will need in the academic environments they will likely move to in the future. For example, identify the knowledge and skills required in arithmetic, reading and science.

3. Each student's curriculum should teach the academic skills the student will require in the academic environments he will likely move to in future.

4. These academic skills should be learned and practised in the form in which they must eventually be performed. The problems of generalization may be reduced by teaching functional skills in the same form in which they must eventually be performed.

5. Organize the curriculum in terms of environments (e.g. home, community, vocational and school). Teach the functional skills required in each of these environments. A curriculum developed in this manner will result in each student being taught all of the academic skills they are capable of learning and using. In addition, each academic skill will be learned and practised in a functional form.

6. Teach each of the areas of the curriculum in proper proportion depending upon the nature of each student. For example, each year, review the skills required by each student in each of the environments. Determine what skills the student requires but does not have in his current environments, and what skills he will require but does not have in each of the future environments. Example programmes for three students are shown below. The amount of emphasis in each area of instruction is shown. All three students are ten years of age. Student one is blind and capable in the next year of passing to the next level of academic study. His long term goal is to enter university. His programme is mostly academic. He is also being taught a number of functional skills relating to the general community. A few skills functional in the home are also being taught.

Area of curriculum	Student		
	1	2	3
Academic	high	low	low
Vocational	none	low	high
Community	medium	high	medium
Home	low	high	low

Student two is moderately retarded. He has not learned many academic skills and will not likely learn many more. His long-term goal is sheltered employment and independence in the community and home. He will likely have considerable recreational time. There are many functional skills in the community and the home that he needs but does not have. His programme focuses on teaching functional and recreational skills for the community and home environments. As he gets a little older, the amount of emphasis in the vocational area may be increased (he may be taught to perform very specific vocational skills under supervision).

Student three is physically handicapped and mildly mentally retarded. He is not strong in academic areas of performance and will likely not achieve a high academic level. He is capable of learning some additional practical academic skills to assist him in other areas of his life. With suitable training he will likely be able to gain independent employment. His programme is starting to focus on training vocational skills. He is also being taught a number of functional community skills.

The programmes for each of these students will be reviewed each year and the relative amount of emphasis in each area of instruction will be reviewed. The purpose of each programme is to train a student to be as functional as possible in each of the major areas of his or her life.

Working toward the ideal curriculum

As was mentioned, a curriculum developed on the basis of an ecological inventory represents the ideal. Some of the methods described may be readily adopted. Other methods may require considerable time and effort before they can be adopted. Methods of working toward the ideal are described below.

1. Do a conceptual ecological inventory. If time is not available for teachers to study the different environments, they can at least think about and make a list of the functional skills they think will be required in the home, community, vocational and school environments. In addition, parents could be asked to help identify tasks that are required in the home and community environments. The relative importance of the skills identified in this manner can be evaluated using the previously described 'task importance rating scale. The more important skills can be put into the curriculum. Several teachers can work together on a conceptual ecological inventory.

2. Small trial ecological inventories can be done. Teachers may select a small but important subenvironment in their community. They may then observe handicapped and non-handicapped students from the same family (follow the previously described methods of identifying one or two families) perform in these subenvironments.

3. Different groups of teachers in other classrooms, schools or communities could do ecological inventories on different subenvironments and share them with other teachers.

4. To reduce problems of failure of skills to generalize, use in situ teaching wherever possible. Teach skills in the form and in the environments in which they must be performed. Where it is difficult to teach in the actual environment, build simulated environments. Build a simulated environment that is as similar as

possible to the actual environment. Teach the skills in the simulated environment. For example, if it is difficult to teach in an actual market, build some simulated market stalls in or near the school. Note, however, the more differences there are between the conditions in the simulated and natural environments, the more difficulties there will be with generalization.

Additional suggestions for approximating ideal tests and curricula are discussed in the next chapter.

CHAPTER TWO

TESTS AND CURRICULA

As mentioned in the previous chapter, an ecological inventory can be used to make a criterion referenced test (described below). In the following example, an ecological inventory has been done in the home environment. In the kitchen subenvironment of the home, the task of lighting a kerosene lamp has been identified. Then a task analysis was done to learn what steps are involved in lighting a kerosene lamp. These steps are listed below.

1. The lid is screwed off the reservoir.
2. The funnel is put into the reservoir.
3. The kerosene container is opened.
4. Kerosene is poured into the reservoir.
5. The kerosene container is closed.
6. The funnel is removed from the reservoir.
7. The lid is put back on the reservoir.
8. The knob at the base of the wick is turned to raise the wick.
9. The glass chimney is removed from the lamp.
10. A match is struck and the wick is lighted.
11. The glass chimney is replaced on the lamp.
12. The knob at the base of the wick is turned to lower the wick.

Next, an instructional objective is written to describe the task. The instructional objective follows:

Given: an empty kerosene lamp, a container of kerosene, a funnel, and matches, the learner will light the lamp to the following standards: the lamp will not be lighted near an open fire; no kerosene will be spilled; the lid will be put back on the reservoir before the match is struck; the lid

will be replaced on the kerosene container before the match is struck; after lighting, the wick will be turned down so that the flame is X cm high.

An instructional objective has three parts. The conditions describe what is given to the students (a lamp, kerosene, a funnel and matches). The performance part of the objective describes the student's observable measurable behaviour (light the lamp). The standards describe what the students must do/not do to perform the task adequately. The standards are also called the criteria.

This instructional objective may be used as a criterion referenced test of the skills involved in lighting a kerosene lamp. To use the objective as a test, a teacher would give the student the conditions described in the objective. The teacher would tell the student to light the lamp. Then the teacher would judge the student's performance according to the standards. If the student passed all of the standards, she or he would have passed the criterion referenced test of lighting a kerosene lamp. If the student failed one or more of the standards, instruction would be required. The teacher would then look at the list of steps in the task analysis to determine what steps to teach the student. Methods of task analysis and teaching are discussed in the next chapter.

Criterion referenced tests are very useful to teachers. A criterion referenced test compares a student's performance to the standards (the criteria) described in an instructional objective. The instructional objective is very specific. It tells teachers exactly what to test and how to test it. The results of the task analysis tell the teacher exactly what to teach.

A criterion referenced test is different from a norm referenced test. A norm referenced test compares a student's performance with that of other students. A norm referenced test gives a score indicating the level of achievement a student has reached compared to the achievements (the norms) of other students.

Frequently, the norm referenced tests used in developing countries are not suitable. Often these tests have been adopted from European and North American countries. Two problems may arise. First, the norms for these tests may not be suitable for developing countries. As a result, a child living in a remote rural village may be compared to the achievements (the norms) of children living in large, western cities. Obviously the children in these environments have very different opportunities for experience and learning. Because of these differences in opportunities, it is usually not appropriate to compare the children to the same norms.

Often people in developing countries cannot afford the high costs of establishing their own norms. Furthermore, because of the large differences in developing countries between life in cities and villages, slums and wealthy areas of cities, different sets of norms would have to be developed for each environment. Even if these norms were established, problems would still remain. Frequently tests developed for other countries assess skills that are not important in a developing country and fail to test skills that are important. As a result, the content of norm referenced tests adopted from other countries has to be modified and new norms have to be established - at great cost!

Often the benefits of making these changes are not worth the costs. Usually norm referenced tests do not assess a student's ability to perform all of the skills within any area of performance. As a result, a student's performance on such a test does not indicate what essential skills the student has or has not achieved and what skills remain to be taught. Furthermore, examination of a student's performance on individual test questions does not indicate on which skills the student is weak or strong. For example, if a student made more errors on one type of question than on another, the student's performance may indicate either that he or she is more capable in one area of performance or simply that more of one type of question was tested.

In summary, norm referenced tests merely provide a score showing how a student's performance compares with the achievements of other students. In developing countries the norms to which students are compared are often not suitable. Norm referenced tests do not tell teachers what skills, strengths or weaknesses a student has or does not have, nor what skills to teach the student.

Alternatively, a criterion referenced test designed on the basis of an ecological inventory tests the skills required of a specific type of student living in particular environments. As a result a criterion referenced test is ecologically valid. A student's performance on a criterion referenced, task analysed test indicates which essential skills the student has or has not achieved and which essential skills remain to be taught.

Criterion referenced, task analysed tests represent the ideal test for teachers. However, these tests require considerable time, effort and skill to develop. In some situations, temporary compromises may have to be made. Criterion referenced and norm referenced tests and curricula designed for other cultures can be adopted and modified. With caution some of the previously mentioned difficulties can be minimized.

Adopting existing tests and curricula

In some cases, it may be necessary to adopt and modify tests and curricula designed for other countries. Unfortunately these tests and curricula designed for use in other environments may not be ecologically valid in developing countries. Skills may be taught and tested that are not required in developing environments. Essential skills that are required in developing villages or cities may not be taught or tested. When adopting tests or curricula designed for other environments, care should be taken to insure that the testing/teaching materials fulfil the following requirements:

1. The materials must be ecologically valid (the skills taught or tested must be functional in the environments in which they will be used).
2. The skills must be taught in a form that will assist generalization.
3. The skills being taught must be important to the students (refer to the previously described 'task importance rating scale' in the ecological inventory section of the previous chapter).
4. The materials being taught/tested must be instructionally valid (they must teach all and only the skills required; no essential skills should be missing and no unnecessary skills should be included).

The steps listed below describe a series of questions, decisions and actions to be made in the selection of testing and teaching materials having the previously described characteristics:

1. Is the task listed in the test or curriculum being reviewed functional and age-appropriate? For example, is the task one that non-handicapped persons of the same chronological age would generally be required to perform currently or in the near future in the environments in which the test or curriculum will be used?

2. Is the task functional to a specific handicap? For instance, is the task one that a handicapped person, because of the nature of his or her handicap, would be required to perform currently or in the near future? For example, deaf students must learn to read speech, finger spell and use sign language.

If the answer to both questions 1 and 2 is 'No', do not teach or test the skill.

If the answer to questions 1 or 2 is 'Yes', evaluate the relative importance of the skill. Use the 'task importance rating scale' in the ecological inventory section of the previous chapter. Also, ensure that the curriculum or test places appropriate emphasis on various areas of performance: home, community, recreational, school and vocational relating to the students in the target group. Refer to the discussion on this topic in the 'curriculum content' section of the previous chapter.

3. Will learning generalize? Is the task being taught/tested in the same form in which it must be performed by the handicapped person in his/her current or future environments? For example, sorting blue, green, red and yellow colour cards is not a form in which a person is usually required to sort colours in the natural environment. Sorting mature and immature fruit on the basis of colour is a form in which colour sorting is more likely to be required in some communities.

4. Will learning generalize? Is the task being taught/tested under the same environmental conditions in which it must be performed by the handicapped person currently or in the future?

If the answer to questions 3 and/or 4 is 'Yes', and if the skills are important to the target group of students and provide an appropriate emphasis within each of the areas of performance, teach and/or test the skills.

If the answer to questions 3 and/or 4 is 'No', either change (a) the form of the task to make it as close as possible to the form in which the task must be performed or (b) change the conditions so that they are as close as possible to natural conditions. As was mentioned in Chapter One, when in situ teaching and testing are not possible, simulated conditions may be used. However, the greater the difference between the simulated and the natural conditions, the more difficult it is for generalization to take place.

5. Is the test or curriculum instructionally valid? Generally handicapped students learn skills slower than other students do. To help handicapped students learn as many functional skills as possible in the limited time available, it is important that test and curriculum materials teach/test all and only the skills required. No essential skills should be missing, and no unnecessary skills should be included. Some tests and curricula do not test or teach all of the essential skills in an area of performance. Some tests and curricula test/teach unnecessary skills and waste important time the student could use to learn essential skills. A well designed test or curriculum designed on the basis of a task analysis is instructionally valid.

A number of tasks commonly found in tests and curricula are reviewed below. The functionality and instructional validity of these tasks is discussed. The following tasks are often referred to as cognitive, pre-academic or readiness.

1. Build a tower of blocks.
2. Put pegs in a pegboard.
3. Reproduce a repeating block or bead pattern.
4. Complete a six piece, interlocking, picture puzzle.
5. String beads.
6. Put a circle, square and/or triangle in a form board.
7. Put a set of nesting cups together.
8. Copy geometric forms.
9. Put a series of ten cylinders in order of increasing size.

These tasks are not functional. They are not required of handicapped or non-handicapped persons in most environments. For example, there are very few people outside of school environments required to put pegs in a pegboard. Why is this task often included in tests and curricula? The task is included because it teaches pincer grasp, eye-hand co-ordination and pattern copying skills. Since these skills are a part of many essential tasks that students will be required to learn later, the skills are called readiness or pre-academic skills. The pincer grasp is expected to generalize from picking up the pegs to picking up and holding a pencil. The eye-hand co-ordination and pattern copying are expected to generalize to learning to print and copy letters. Unfortunately, as was previously mentioned generalization is a major problem in education. The skills learned by handicapped children frequently do not generalize from one type of performance to another. Some handicapped children may learn to put pegs in a pegboard but their ability to pick up a pencil, or copy a letter of the alphabet may not improve. Learning these readiness skills may not result in improved performance or learning of functional skills. As a result, a handicapped student taught readiness or pre-academic skills is required to learn one set of skills that are not functional, then learn a second set of skills that are functional. Since handicapped students are already behind in achievement and slow to learn, it would be more efficient to teach eye-hand co-ordination, pincer grasp and pattern copying once - in a functional form. Thus, although the skills involved in putting pegs in a pegboard are useful skills, the skills are not being

learned in a form in which they must be performed in the natural environment.

Tasks like the nine previously described pre-academic, readiness or cognitive skills listed in a test or curriculum should either be replaced by functional skills or they should be removed. For example, a task like stringing beads should be replaced by a functional task, if there is currently or in the near future an important, functional task that requires the same skills. Otherwise, simply remove the task from the curriculum or test.

As mentioned, the nine tasks listed above were described as academic tasks. Because of difficulties with generalization of learning, it was recommended that these tasks should be removed or replaced. It was also recommended that academic tasks should be taught in the form in which they must eventually be performed by the student in the natural environment. Direct instruction of academic skills eliminates the problem of generalization. Alternatively, some of the nine tasks listed above may be considered recreational. For example, stringing beads and completing picture puzzles are not acceptable academic tasks but they may be acceptable recreational tasks. These tasks may be kept in the recreational part of the curriculum if:

1. they are recreational activities that non-handicapped persons of the same chronological age generally perform;
2. they are recreational activities that a handicapped student must perform because of his/her handicap;
3. there will be opportunities for students to perform these recreational activities in the general community; and
4. these recreational activities, of all the recreational activities the students could be taught, will offer the most personal benefit.

For similar reasons the following types of tasks should also be removed, replaced or modified in tests and curriculums:

1. the student will jump raising both feet off the floor at the same time;
2. the student will walk forward or backwards on a balance beam;
3. the student will stand on one foot without aid for 4-6 seconds.

Test and curriculum tasks described in the following manner are too vague. As a result students may be taught non-functional tasks:

1. the student will imitate a three action motor sequence;
2. the student will classify six objects or pictures into categories;
3. the student will repeat nursery rhymes.

Given the task, 'imitate a three action motor sequence', some teachers might teach their students to imitate holding their arms over their heads, out to the sides and out to the front. These activities are non-functional. Other teachers may ask their students to imitate three actions involved in using a village well. These activities will teach the students a functional skill while also teaching imitation of the teacher's actions. Ideally, each task in a curriculum or test should tell the teacher exactly what to teach or test. Also, ideally each task should be described as a functional activity. The above task could be revised in the following manner:

The student will imitate a sequence of three actions in (a) using a village well, (b) mixing and kneading dough for bread, and/or (c) following the steps in adding numbers together.

This task is written in the form of an instructional goal. An instructional objective describes what the student will do at the end of instruction, under specified conditions, to particular standards. An instructional goal describes what the student will be taught, but does not describe the conditions or standards.

As in the previous example, the task description, 'classify six objects or pictures into categories' should be made more specific and functional. Some teachers may spend considerable time teaching their students to classify objects that the students will not be required to classify in the natural environment. Also one set of objects may be far more difficult to classify than another set. The task description may be revised in the form of an instructional goal:

The student will put into separate piles two samples of each of: sugar, salt, and flour, or two samples of each of: corn, wheat, and rice, and/or two samples of each of the letters: 'n', 'r', and 'm'.

Note that these sorting tasks are only functional if the student will be required to perform them in the current or likely future environments. How would you modify the task description,

'the student will repeat nursery rhymes'? Assuming that this task is designed to improve a student's memory, one could teach the series of steps used for solving a particular type of arithmetic problem. Later, the student would be asked to repeat the steps, immediately and/or after a delay. The student might also be asked to buy several things from the market and then be accompanied to the market to see if he or she could remember which things to buy?

Methods of describing tasks in tests and curricula

In the previous discussion, both instructional goals and objectives were introduced. In fact, there are several different ways to describe tasks on tests and curricula. Instructional objectives provide the clearest description of tasks. However, objectives take considerable time to write. In the early stages of writing or modifying tests or curricula, other less specific methods of describing tasks may be acceptable. Several methods of describing tasks are listed below:

- (a) The learner will use appropriate verb tenses.
- (b) The learner will describe an object using the past and present tenses.
- (c) The learner will describe an object using the past and present tenses, for example: 'This glass was full' and 'This glass is not full'.

Task description (a) is simply too vague. Task description (b) provides more detail. Note that task description (c) not only provides examples of the past and present tenses but it also indicates that the glass may or may not be full in the past or present. Teachers using description (b) above, may not have taught the past, the present and the positive and negative examples. Therefore, it is often important to include examples of what the student will and/or will not be able to do. The following task description states when the student will use the verb tenses and under what conditions.

- (d) Given (conditions) a glass that is randomly either empty of full, in sight or removed from sight, the student will be asked to 'Use a sentence to tell me about the glass'. The student must answer as appropriate either that 'The glass is or is not full', or that 'The glass was or was not full'.

This objective may be further refined to describe a number of situations involving a variety of objects that are or were present and that do or do not have various qualities such as fullness,

roundness or redness. The number of trials under each condition may also be described as in previous examples of instructional objectives. The standards of performance may be described. For example, should the student be expected to perform perfectly on 20 different trials? Few people are perfect, so perhaps a few errors could be accepted. If errors are acceptable, the objective may describe how many and what type of errors are acceptable.

Major steps in the development of criterion referenced,
task analysed tests and curricula

The following discussion briefly summarizes the major steps involved in the development of criterion referenced, task analysed tests and curricula. A detailed discussion of the method of performing each of the steps is described at various points in this teachers' guide. For example, methods of performing a task analysis were introduced in this chapter and are further discussed in the next chapter. One should be aware that completion of all of the following steps would require many years. Fortunately, however, it is not necessary to complete all of the steps to develop or improve a test or curriculum. As was mentioned earlier, it may be wise to try these methods first with a small number of students and a limited area of the curriculum. The procedure can be expanded later.

1. Define the target group of students in the previously described manner.
2. Identify a broad variety of different types of families having at least one handicapped person from the target group and at least one other non-handicapped person of the same sex and similar chronological age.
3. Perform an ecological inventory on both the handicapped and non-handicapped persons in each family; study both current and future environments and skills as described in chapter one.
4. Identify those functional tasks performed by the non-handicapped person that it is likely the handicapped person could perform with prosthetic assistance or instruction.
5. Use the 'task importance rating scale' to decide if these tasks should be included in the curriculum or test being designed for students in the target group.
6. These major tasks may be written in the form of behavioural goals and listed into a checklist. The most descriptive type of goals should be selected; review the

previous discussion of goal types. This checklist can be used as the simplest type of test or curriculum.

7. Following further experience with the tasks described in the checklist, one may rewrite each of the tasks in the form of a behavioural objective. The revised checklist may continue to be used as a test or curriculum.
8. Task analysis may be used to further refine the test and curriculum. Each of the tasks described in the instructional objectives may be task analysed to identify the steps involved in performing the task (review the previous example of the lantern lighting task).
9. Each of these steps may be written in the form of instructional goals. The checklist of major tasks and steps may be used as a test in the following manner. The major tasks described as behavioural objectives in step 7 may be used as a screening test to identify which major tasks a student has or has not mastered. When a student fails to meet the standards (criteria) described in one of the behavioural objectives, the list of steps for the objective may be used as a diagnostic test to determine which steps the student can and cannot perform. This testing will reveal what skills to teach to the student. The list of steps not mastered can be used as a curriculum.
10. In the final stage of refinement, each of the steps in the checklist may be rewritten as behavioural objectives.

The following discussion provides a review of several criterion referenced tests and curricula.

Examples of tests and curricula

The Enright diagnostic inventory of basic arithmetic skills

The Enright test written by B.E Enright was published in 1983 by Curriculum Associates, Inc., 5 Esquire Road, North Billerica, MA 01862-2589, U.S.A. The cost of the materials is approximately \$85.00 (U.S.). This is a criterion referenced test. One hundred-and-forty-four basic computational skills are tested. The skills tested are: addition, subtraction, and multiplication of whole numbers, fractions and decimals. These are the computational skills taught in the first nine years of school in North America. Each skill tested is very clearly defined. The skills are sequenced in order of difficulty. As a result, the test indicates the order in which the skills should be taught. For each skill tested, a very clear explanation is provided of

each of the types of errors that can occur. Examples and explanations of 233 different types of errors are identified in the test. An understanding of the nature of these errors helps remedial teaching. This is an excellent test of computational skills suitable to any culture in which these skills are taught. Note that the test does not assess all of the mathematics skills taught during the first nine years of school. Only computational skills are tested. For example, there are no tests of measurement (metrics), problem solving, time or other functional applications. There are no tests of adding two bananas to two bananas. This is an excellent test of computational skills but it is not a test of skills in the form in which a student must use them in the natural environment. Thus, the test may help a teacher in both testing and teaching but its limitations must be clearly understood. As described earlier in this chapter, all curricula should teach functional application of the skills in the form in which they must be used in the natural environment. Also available is a practice and review series of exercises corresponding to the skills assessed in the test; this material costs approximately \$100.00 (U.S.).

Direct instruction mathematics

The following mathematics textbook is recommended: Silbert, J., Carnine, D. & Stein, M. Direct instruction mathematics, Charles E. Merrill Publishing Company, Columbus, Ohio, 43219, U.S.A.; approximate cost \$27.00 (U.S.). This textbook provides a complete review of the mathematics skills taught in the first six years of school in North America. Methods of teaching and testing each of the skills is described. The skills taught and the methods used are suitable to handicapped and non-handicapped students. This is an excellent textbook for training teachers and an excellent reference for trained teachers. Materials for teaching students are not provided. These materials may be taken from existing programmes (modification will often be required) or new materials may be made (considerable work would be required). Many skills and concepts are discussed in the text. As a result, teachers may need assistance learning and using the methods described in the textbook. The skills taught in this textbook will generally be suitable to most cultures. Note, however, the textbook does not describe functional use of the skills taught. For example, methods for teaching students to divide one number by another are clearly described. However, no methods are described for teaching students how and when to use division in the natural environment. As was previously discussed generalization of a skill from the classroom to the natural environment is a major problem with handicapped children. Functional use of skills must be taught directly to reduce the problems of generalization. The methods described in this textbook should be used with an ecological inventory. The inventory will indicate what skills are needed in the natural environment and the form in which the skills

must be used. This is the form in which these skills must be taught and practiced.

Instructional objectives exchange

The Instructional Objectives Exchange, Box 24095, Los Angeles, California, 90024 has several instructional objective collections available describing the skills learned during 12 years of school in North America. Separate instructional objective collections describe skills in computation, geometry, and algebra, reading decoding, reading structural analysis and reading comprehension. Each objective collection costs approximately \$15.00 (U.S.). The instructional objectives in these collections are well written but the manner in which the skills are tested is very culturally biased. As a result, these collections are not recommended in their current form. However, the material may serve as a model for the development of more culturally suitable tests and curricula - considerable work would be required!

Direct instruction reading

The following reading textbook is recommended: Carnine, D. & Silbert, J., Direct instruction reading, Charles E. Merrill Publishing Company, Columbus, Ohio, 43219, U.S.A.; approximate cost \$27.00 (U.S.). This textbook provides a complete review of the reading skills taught in the first eight years of school in North America. Pages 1-286 and 508-530 relate to the first three years of instruction. Pages 287-489 relate to the fourth to eight years of school. Methods of teaching and testing each of the skills is described. The skills taught and methods used are suitable to both handicapped and non-handicapped students. This is an excellent textbook for training teachers and an excellent reference for trained teachers. Note, reading is a complex task. Testing and teaching reading are also complex. Although this textbook is written in a clear and direct way, the amount of detail and the number of concepts discussed reflects the complexity of the topic. As a result, teachers using this book may need considerable support and guidance from trained persons. The textbook provides a complete course in teaching the reading of English. Materials for students are not provided. Teachers wishing to use the methods described in the textbook may (a) use the materials in an existing reading programme (some modification to the materials would be required), or (b) prepare materials for the students. Considerable work would be required to prepare these materials. The instructional procedures described would generally be suitable for any culture. Some of the words recommended in the textbook for testing and teaching would not be suitable in various cultures. For example, some words that would likely be unsuitable are: mitt, bat, sam, park, roast, skate,

sneaker, catcher and cowboy. Unsuitable vocabulary will usually be found in reading materials made for different cultures.

DISTAR

Curricula have been developed using the same methods of task analysis and teaching methods discussed in the previously described textbooks. DISTAR reading (Reading mastery in the revised form) and DISTAR arithmetic teach the reading and arithmetic skills taught in, respectively, the first six and three years of school. These are excellent programmes providing the most comprehensive and detailed description of skills and teaching methods available. Each programme includes a number of criterion referenced tests. All of the teaching materials are provided as are very detailed instructions for teaching each skill. Considerable research has demonstrated the usefulness of these programmes. Unfortunately, the programmes are quite expensive. Also, the materials are quite culturally biased and teachers using the programmes require specialized training (one month of high intensity training should be sufficient).

The Zimcare Trust, P.O. Box BE 90, Belvedere, Harare, Zimbabwe, has been using the DISTAR programmes since 1982. The original materials were found to be culturally inappropriate. New materials were developed to suit Zimbabwe. Revised forms of the DISTAR reading, language and arithmetic programmes are used. Correspondence received from Zimcare states that research evidence and limited experience in Zimbabwe with pilot projects indicated that these programmes result in better learning of language, reading and mathematics than had been achieved with any of the previously used curricula. It has also been reported that some of the skills taught did not generalize adequately. Lack of generalization is common with the DISTAR language programme.

Several tests are commonly used for the evaluation of a variety of social-personal and adaptive behaviours. All of these tests are very culturally biased and are unsuitable to developing countries. Some of these tests, described below, may serve as useful models for the development of culturally suitable tests.

The Vineland Adaptive Behaviour Scale (1984 edition)

The Vineland Social Maturity Scale, Interview Edition, Survey Form, 1984, written by Sparrow, S.S., Balla, D.A. & Cicchetti, D.V. is available from the American Guidance Services, Inc., Circle Pines, Minnesota 55014 - 1796 at an approximate cost of \$78.00 (U.S.). This is a norm referenced scale (the norms are not suitable to developing countries). There are 297 test items, of the following type, covering the range from birth to adulthood.

Sample test item: Advanced house-cleaning:

1. Sweeps, mops or vacuums floor carefully, without assistance, when asked.
2. Cleans room other than own when asked.
3. Straightens own room without being reminded.
4. Cleans room other than own regularly, without being asked.

Each item is scored as 2: yes, usually; 1: sometimes or partially; 0: no, never; N: no opportunity; or DK: don't know. The major performance areas reviewed on the scale are: communication (receptive, expressive, and written), daily living skills (personal, domestic and community), socialization (interpersonal, playing, leisure and coping), motor skills (gross and fine motor) and maladaptive behaviour. It is apparent from the example that some of the items are quite unsuitable to developing countries. Nevertheless, the scale may serve as a useful model for the development of a similar scale based on an ecological inventory of a developing country.

AAMD Adaptive Behaviour Scale

Samples of the AAMD (American Association of Mental Deficiency) Adaptive Behaviour Scale: school edition (1981) are available from the CTB/McGraw-Hill, Del Monte Research Park, Monterey, California 93940 at a cost of approximately \$11.00 (U.S.). The scale has been normed on mentally retarded, emotionally disturbed and learning disabled students from ages three to sixteen. The scale is similar to the Vineland. Dr S. Upadhyaya, Department of Psychology, University of Jodhpur, India, conducted a study in 1974 to adapt the original (1969) form of the AAMD to suit the Indian context. Many adjustments were required to adapt the scale.

A practical method of performance monitoring

For each student a bi-weekly planning guide could be developed. The guide would consist of sheets of paper with the titles of each area of instruction: home, school, community, and vocational listed approximately 2.5 inches apart down the left side of a page. Every two weeks, opposite each title, the teacher would list the instructional goals or objectives for a particular student for the following two weeks. For example, opposite the home environment category for one student the following goals may be listed: using sand to extinguish an oil fire on the stove; care for cuts and wounds: cleaning, using antiseptics, stopping bleeding, bandaging, and seeking medical help when required; and storing food and water away from insects and rodents. A file

folder should be established for each child for storing his/her planning sheets. The file should also contain brief examples of current and past performance in each of the areas of instruction. Thus, the goals for the next two weeks would be based on the achievements and problems of the past two weeks. An examination of any file would clearly indicate the student's achievements in each area. Rather than prepare the bi-weekly planning sheets for all students on the same day, a teacher might prepare them for one or two students each day. Preparation would involve collecting the best examples of the student's work in each area. In some areas, a brief test of skills may be given. Based on this information, kept in the student's file, goals may be selected, and recorded on the planning sheet. Each student's file could be reviewed on a bi-monthly basis by the school principal or supervising teacher in consultation with the student's teacher. Both principal and teacher would date and sign the file indicating that the student's performance had been adequately tested and that appropriate goals had been selected and achieved, or that necessary changes (specified) had been made to the teaching procedures. The records contained in these files may be used to evaluate student progress, and the appropriateness of placement in a special or integrated programme. The files will also provide an indication of teacher effectiveness.

CHAPTER THREE

METHODS OF INSTRUCTION

Group and individual instruction

Group instruction

Individual instruction (one teacher to one student) is often recommended as a method of teaching handicapped students. Individual instruction, however, has several disadvantages. First, it is relatively expensive. Second, it is often inefficient. Teacher attention is given to only one student at a time. Third, prolonged individual instruction on one task with one student (massed practice) often does not produce the best type of learning.

There is considerable evidence showing that group instruction (one teacher to two or more students) can be used effectively with mildly, moderately, severely and even profoundly multiply, handicapped students. Furthermore, in many cases, there are several advantages to group instruction over individual instruction.

1. Group instruction is more efficient and less expensive. More students are often taught more effectively in the same period of time.
2. Various kinds of skills are often learned as rapidly.
3. In 'sequential' group instruction (discussed below) 'distributed practice' may improve 'maintenance' (recall of learning).
4. In sequential group instruction where students in the group are taught different skills, 'generalization' of learning may result. That is, students may learn the tasks being taught to other students in the group, observational learning.
5. When one student is rewarded for performing in a suitable manner, she or he acts as a good model for other students to imitate.

Two major types of group instruction are discussed below. The most suitable type of group instruction to use at a particular time depends upon the nature of the task and the students being

taught. Different methods of group instruction may be suitable at various time. Usually, however, 'sequential' methods will be more suitable to students functioning at a low level of performance (very young, inexperienced, severely mentally retarded, or multiply handicapped). While 'current' methods may be more suitable to higher functioning students. These students may have relatively well developed language skills and they may be more able to imitate a teacher's model or demonstration. Note, however, that even very severely, multiply handicapped students have been successfully taught with 'concurrent' methods. Sometimes students may begin with individual instruction, begin group instruction with the 'sequential' model and then move to the concurrent model of instruction.

Sequential group instruction

In sequential group instruction, several students (2 or more) are grouped close together. The students may be seated at desks in a semi-circle, around a table, standing around the village well or in a field. Each student is taught independently for short periods. The teacher works briefly with one student then works briefly with another. During the total period of group instruction, the teacher will work several times with the same student.

Students in the group may be at the same or different levels of achievement. They may be taught the same or different skills. Each student may be treated entirely independently from the other students. Individualized methods of instruction may be used. Alternatively, the teacher may sometimes give general instructions or a demonstration at the same time to all students in the group before beginning sequential instruction.

Sequential group instruction may provide a useful transition from individual to concurrent group instruction for students who are severely mentally retarded, multiply handicapped or who are simply inexperienced learners.

The benefits of this type of group instruction are as follows:

1. Each student receives individualization of instruction. The skills taught and the methods of teaching used are selected to suit each individual learner.
2. Each student receives several uninterrupted trials practicing the same task (massed practice). Practice of this type (for a suitable period of time) helps to establish new skills.
3. After a brief period of either (a) inactivity, (b) observation of other students being instructed, (c) self-directed practice of a recently taught skill, or

(d) a self-directed entertaining activity, the student is again introduced to the previously taught skill (distributed practice). Distributed practice of a skill makes a new skill more durable (a student is less likely to forget a skill taught by distributed practice).

4. During sequential instruction, students may be taught a variety of skills required for concurrent group instruction. For example, the students may be taught to sit side-by-side for long periods without interfering with each other. They may be taught to focus more effectively on demonstrations, and listen to verbal instructions.
5. In sequential group instruction where students in the group are taught different skills, 'generalization' of learning may result. Students may learn the tasks being taught to the other students in the group, observational learning.

Some suggestions

1. A teacher may begin with two students in the group and later expand to three, then four and up to six students.
2. The students may be taught to work with each other. For example, a hearing impaired student who is learning how to speak may request a drink from a blind student who is learning how to pour liquids. Students taught to interact in this manner can briefly practice their newly learned skills while the teacher works with another student. Since the teacher is close to all of the students, guidance can be provided as required.
3. If a student is behaving inappropriately, other students in the group may be rewarded for acting properly. Thus, the student behaving appropriately will act as a model of good behaviour for the other students to imitate.
4. Before the teacher moves from teaching one student to teaching another, it is important to give the first student enough practice to help him/her learn the relationship between the stimulus (the materials, demonstration or instruction presented) and the correct student response.

When moving from teaching one student to teaching another, the teacher should not leave any student without attention for too long. The teacher can decide how long to teach each student by looking at how long it takes to teach new tasks, how well the student is able to perform the task when the teacher later returns to the student,

and how many behaviour problems occur among students when they are not being taught. Sometimes a teacher can be teaching one student while giving occasional rewards to other students for waiting, observing other students being taught, practicing what they were previously taught, or working on entertaining activities.

5. Before beginning sequential group instruction, the teacher should make sure that she or he has all the materials required for each student. Also in advance, the teaching method for each student should be prepared and rehearsed. There is substantial research to demonstrate that a rapid and smooth change from one teaching task to another results in a lower error rate, and fewer behaviour problems.
6. The teacher should begin with a small group of students and a simple task. Or, begin with two or three students working alone before putting them into a group of two then three students.

Concurrent group instruction

In concurrent group instruction, several students (two or more) are grouped close together. The students may be seated at desks in a semi-circle, around a table, standing around the village well or in a field. All students are taught by the teacher at the same time. This is the conventional form of group instruction. Concurrent group instruction may be introduced in stages using the previously described methods.

Students within the group must all be at the same general level of achievement. The students must all be able to learn from the same methods of teaching.

Attention, model, prompt and test teaching model

The following teaching model may be used with adaptations for individual, successive and concurrent instruction. The following example demonstrates the model being used in concurrent group instruction. Later, examples will be given of the model being used in individual and successive instruction.

STEP	EXAMPLE
1. Get group <u>attention</u>	'Everyone, look at me'
2. Present materials	Show the letter 'a'
3. Focus <u>attention</u> (optional)	'Look at this letter' Teacher points to 'a'

- | | |
|--|--|
| 4. <u>Model</u> the response | 'This letter is "a"' |
| 5. Repeat focus and model
(optional) | 'Look at this letter'
Point to 'a'
'This letter is "a"' |
| 6. Request | Point to 'a' and ask:
'What letter is this?'
(hand signal) |
| 7. <u>Prompt</u> (<u>Lead</u> : Say
the response at the same
time as the students do) | 'This letter is "a"' |
| 8. Repeat request and prompt
(optional)
(hand signal) | 'What letter is this?'

'This letter is 'a'' |
| 9. <u>Test</u>
(hand signal)
(do not lead) | 'What letter is this?'

'This letter is "a"' |
| 10. Reward or correct | 'Good, you are learning
to read "a"' |

Note that the essential steps in this teaching method are attention, model, prompt and test. This method can be used whenever students are to make a relatively brief, observable, verbal or motor response and where the teacher may provide all the assistance required to the whole group at one time rather than to particular students. For example, the teacher may use sign language to ask deaf students for the manual sign for elephant. The students and the teacher (leading) would respond with the correct sign at steps 7 and 8. The students alone would give the sign at step 9 (the test). Or, the teacher may ask a group of students to answer the question. 'What does $5 + 4 = ?$ ' At steps 7 and 8 both the teacher and the students would say ' $5 + 4 = 9$ '. The students alone, would give the same answer at step 9.

Note the teacher uses a hand signal each time the students are to answer. The hand signal is used in the following manner:

- (a) At the same time as the teacher asks the question, his/her hand is raised to shoulder level. This part of the signal tells the students that they will soon be expected to answer the question.
- (b) The teacher holds the hand at shoulder level long enough to give the slowest learner in the group time to prepare the answer.

- (c) Then the teacher drops his/her hand to waist level. This is the signal that all the students are to give the answer at the same time.

The students will repeatedly have to practice answering to a signal at the same time. Continue to practice until no student answers early or late to the signal. When all students answer at exactly the same time the slow students cannot copy the fast students. Therefore, to give the correct answer all students have to learn the correct response. They cannot simply copy the response from other students.

When all of the students answer at the same time, if one student makes a mistake, the skilled teacher (it takes practice) can hear the mistake, and will give correction. The teacher does not directly correct the child who made the mistake. If the teacher did give attention to the child who made the mistake, the child may be taught to make mistakes to get the teacher's attention. Most students like teacher attention and are willing to make mistakes to get that attention. Instead, the teacher corrects the wrong answer by reteaching the whole group. The teacher models the correct response, again leads the group response, then tests the group. Alternatively, if the teacher is quite certain that a particular student will answer correctly, the teacher may have that student model the correct response to the group. With this method, only students who model appropriate behaviour get teacher attention.

Every time the teacher asks the group to answer a question, all students in the group get practice giving the correct answer. If the group is carefully taught, all students will get practice making the correct response several times. Alternatively, in other approaches to teaching, when students are allowed to guess the correct answer or work on their own, students having difficulty often practice giving the wrong answer. To avoid these problems, teachers should not permit students to guess answers or work alone on a skill unless the students can make the correct response.

Usually group instruction using this method lasts for 12-15 minutes at a time. In the beginning teachers may wish to begin with:

- (a) Shorter sessions and slowly increase the amount of time.
- (b) A small group and slowly increase group size.
- (c) Individual or sequential instruction using the previously described teaching model before introducing the students to concurrent instruction.

The advantages of the teaching model are listed below:

1. The same attention, model, prompt and test method can be used for teaching an individual or a group of students. Using a consistent approach to teach different tasks assists the learning process.
2. The model is designed to end guessing. When children do not know the answer, they may guess the wrong answer. When students guess (model) the wrong answer to a question, they increase the likelihood that the same wrong answer will be given the next time the question is asked. The more difficult the question, the more wrong answers may be guessed (modelled). To stop guessing, the teacher models the correct response before asking the students the question.
3. This method is designed to reduce mistakes. After the teacher has several times modelled the correct answer for the students, the students may need some assistance giving the correct answer on their own. Therefore, after the teacher asks the question, the teacher leads the students to say the correct answer; the teacher answers at the same time as the students. The teacher gives the correct answer several times until the students can give the correct answer rapidly, consistently and accurately. The teacher does not test the group until she/he is sure that all of the students will give the correct answer.
4. Students are not asked individually to answer the teacher's questions until the teacher is fairly certain the students can individually give the correct answer. Thus, students are given repeated practice giving the correct answer along with the rest of the group before they are asked to answer individually.
5. When the teacher is quite certain the weakest students in the group know the correct answer, these students may be individually tested. If they get the correct answer, the teacher knows it is time to teach a new task to the whole group. When the weak student gives the right answer, the teacher gives the student a big reward for the answer. Thus, rather than give weak students attention for giving wrong answers, the teacher gives big rewards for correct answers.
6. This model has been used successfully with a broad variety of ages and types of students and tasks.
7. Research shows that when this method of teaching is used properly, students pay more attention to the teacher,

have fewer problem behaviours and give more correct answers than they do if other methods of instruction are used.

A suggestion

As was mentioned, students within the group must all be at the same general level of achievement and they must all be able to learn from the same methods. A large classroom of students may have to be divided into several smaller groups at different levels of achievement. Some students may learn more rapidly than others. If a student learns less or more than the other students in a group, she/he may have to be moved to a lower or higher achieving group.

Individual instruction

Individual methods of instruction may be used for teaching more difficult students in isolation from other students or during sequential group instruction. Also, some tasks requiring considerable individual assistance may be better taught through individual rather than group instruction. The previously described attention, model, prompt and test teaching method may be used with modifications in individual instruction and in successive group instruction. In the following example, the teaching model has been modified to teach a motor response (planting seeds) during individual instruction.

STEP	EXAMPLE
1. Get student's <u>attention</u>	'Kofi (student's name) look at me'
prompt (optional)	Use hand to turn student's head
2. Present materials	Show three fingers of left hand and seeds in right hand
3. Focus <u>attention</u>	'Look, seeds and three fingers'
(optional)	Move hands toward student
4. <u>Model</u> the response	'Plant the seeds three fingers apart, like this'

- | | |
|---|--|
| 5. Repeat focus and model
(optional) | 'Look, a seed; three
fingers; a seed; three
fingers... |
| 6. Request | 'Plant seeds three
fingers apart' |
| 7. <u>Prompt</u>
(Use <u>physical prompt</u>
rather than lead prompt) | Physically help student
to position three
fingers and plant seeds
three fingers apart |
| 8. Repeat request and prompt
(optional) | 'Plant seeds three
fingers apart' |
| 9. <u>Test</u>
(do not prompt) | 'Plant seeds three
fingers apart' |
| 10. Reward or correct | 'Good, you got the
seeds three fingers
apart' (point to the
fingers and the seeds) |

There are several small differences between this example of the 'attention, model, prompt and test teaching method' and the previous example used with concurrent instruction:

1. Since there is only one student, hand signals are not used to get a group response.
2. Since the student is at a lower level of functioning, a prompt (assistance) may have to be used to get the student's attention.
3. In steps 7 and 8, a physical prompt rather than a leading prompt is used to help the student.
4. If correction is required, the 'attention, model, prompt and test' sequence is repeated with a change in the prompts. Various types of prompts and their uses are discussed below.

Prompts

A prompt is a type of temporary assistance used to help a student perform in a desired manner. When a student is unable to perform a task, a prompt (assistance) may be used to help the student perform. As the student learns to perform the task the temporary prompt is faded (slowly removed) from use.

There are several different types of prompts: verbal, gestural, modelling and physical. Use of these prompts is demonstrated in the following example where a student is being taught to use a saw to cut wood. The same 'attention, a model prompt and test' method of teaching as used in the seed planting example is used here with slight modification.

STEP	EXAMPLE
1. Get student's <u>attention</u>	'Udaya (student's name) look at the saw'
2. Focus <u>attention</u>	Point to where the saw meets the edge of the wood
3. <u>Model</u> the response	'Put your feet like this, and your arm like this, place your thumb here next to the saw and pull the saw back slowly'
4. Repeat focus and model	Repeat 'step 3 adding: 'See how this foot is in line with this saw; see how my thumb is right on the line'
5. Request	'You start the cut'

At this point, if the learner is able to perform on his/her own, no prompts are introduced. If the learner cannot perform, prompts are used.

6. <u>Prompt</u>	(a) <u>verbal prompt</u> : 'put your thumb right on the line' (used because the stud- ent's thumb was placed too far from the pencil line)
	(b) <u>Gestural prompt</u> : teacher points from foot to elbow to remind student to line-up foot and arm (student had forgotten)

No additional prompts were required to help the student respond correctly.

- | | |
|---|--|
| 7. Repeat request and restate
<u>part</u> of verbal prompt | 'You start the cut'
'Thumb on the line' |
|---|--|

Note that in this step some of the prompts may be faded from use. If the verbal and gestural prompts are no longer required, they may not be used. Or, the teacher may shorten the verbal prompt to remind the student and say only, 'thumb'. The goal in all teaching is to get the learner to perform properly without prompts (without teacher assistance).

- | | |
|-----------------------------------|------------------------------|
| 8. <u>Test</u>
(do not prompt) | 'You start the cut' |
| 9. Reward or correct | 'Good, you got a good start' |

Note that several small changes have been made in this teaching sequence from that used in the seed planting example. In step 1, attention is focused directly on the saw rather than on the teacher. Step 2 is different. The saw is present from the beginning and is not presented in a separate step.

This teaching sequence could also be used with a group of students at the same time. With a group, the sawing task may be divided into steps as follows. 'Stand in position' (check each student and prompt as required); 'put your thumb on the line' (check each student and prompt as required); 'line-up your arm with your foot' (check and prompt); 'pull the saw back slowly'.

There are various kinds of each type of prompt. For example, there are different types of verbal prompts. The varieties of prompts are described below.

Verbal prompts

Verbal prompts may involve:

1. Giving additional directions: 'put your foot in-line with the saw'.
2. Emphasizing important words by saying them louder: 'Udaya, look at the saw' (used to focus attention on the saw).
3. Single word reminders: 'Thumb'.

4. Pausing: 'Put your thumb (pause) on the line' (used to give student time to focus on his thumb, then to focus his thumb on the line). Pausing may also be used to focus a learner's attention on an important word; the pause in the teacher's directions may help to attract the student's attention and isolate and emphasize an important word.
5. Leading is used when the teacher makes a verbal response at the same time as the students. For example, if students are being taught to remember the steps in treating a snake bite, the teacher may make the request 'What do you do if you are bitten by a snake'? If the students are having difficulty remembering all the steps in sequence, the teacher may use leading and say the following words at the same time as the students say them. 'Tie, cut, suck and spit.' The first time the teacher uses leading the teacher may say the words slowly, giving the students time to hear what was said and prepare the next word. Later, the teacher may say the words faster.

Rules for using and fading verbal prompts

1. A prompt is assistance that helps a student perform in the desired manner. If the student does not perform in the desired manner when the assistance is offered, the type of assistance used was not a prompt. Do not use assistance that does not help the student to perform in the desired manner.
2. Make sure you have the students attention before giving the verbal prompt.
3. Be brief; make all verbal instructions as short as possible.
4. Use language the student understands.
5. Be consistent; use the same verbal prompt each time the task is practiced.
6. Always state the request before using a verbal prompt. For example, give the request, 'Plant the seeds three fingers apart'. Only if the student is unable to perform the task properly should a verbal prompt be used. For example, the teacher might say, 'Three fingers' to remind a student who was going to use two fingers'.
7. Verbal prompts may be faded from use in the following manner:

- (a) Delay: Following the request 'Plant the seeds three fingers apart' the teacher will delay giving the verbal prompt, 'Three fingers'. Over several trials the delay should be longer and longer until the student can perform the task without the verbal prompt. At this point stop using the prompt.
- (b) Shorten: if the teacher is using a long verbal prompt to help the learner, over several trials, the prompt may be shortened. For example, if a student is being taught to clean fish, the teacher may prompt by saying, the request: 'Scale the fish'. Then the following prompts may be used:
 - (i) 'Lay the fish down with the tail away from you'.
 - (ii) 'Hold onto the tail'.
 - (iii) 'Scrape the knife from the tail to the head'.
 - (iv) and so on.

Over several trials each of these verbal prompts may be shortened as follows.

Request: 'Scale the fish'.

- (a) 'Lay the fish down' (the student puts the tail away without being told).
- (b) 'Hold' (the student holds the tail without being told).
- (c) 'Scrape' (the student scrapes from the tail to the head without being told).

The teacher may fade the use of the verbal prompt by using both delay and shortening until the student scales the fish after the request without the use of prompting. Then the lesson is finished.

Gestural prompts

Gestural prompts may involve:

- 1. Pointing: the teacher may simply point to the line where the saw is to be placed. More commonly, the teacher will use a gestural prompt with a verbal prompt and will point at the line while saying, 'Put the saw on the line'.

2. Tapping: the teacher may make a noise by tapping his/her finger on the line where the saw is to go.
3. Tracing: if a teacher is reminding a student to follow several steps to cook rice, the teacher may point in order to the rice, a can for measuring, a pot, water for cleaning, and the stove. The teacher will slowly move his/her hands to each object and pause briefly at the object. Usually, the teacher will also use a verbal prompt with the gestural prompt and say 'rice', 'measure', 'pot', 'clean', and 'cook' at the same time as the objects are pointed to.
4. Signals: during the group instruction example when the teacher made a request raised her hand to her shoulder, paused and then dropped her hand to signal that everyone in the group was to answer. This hand signal is a gestural prompt.
5. Clapping may also be used as a signal. During group instruction when students are being taught to read, the teacher may clap his or her hands each time the students are to read a new word in a sentence. The pause between each clap gives each student time to practice the word before reading it aloud. The students can hear the clap without looking up from their work.

Rules for using and fading gestural prompts:

1. Make sure you have the student's attention before using the prompt.
2. Be consistent; use the same prompt each time.
3. Be brief; do not use extra movements.
4. Use a gestural prompt only if a verbal prompt is not sufficient.
5. If a gestural prompt is used, use a verbal prompt at the same time.
6. Fade the gestural prompt first, then fade the verbal prompt.
7. Fade the use of a gestural prompt by:
 - (a) Delay: when it looks as if the student may not need a gestural prompt, give the verbal prompt first, then delay giving the gestural prompt for a moment. Over several trials, increase the length of the

delay until the student responds before the gestural prompt is given. At this point stop using the gestural prompt.

- (b) Shorten: the length of the gestural prompt may be shortened. Rather than tap the line the saw is to cut, on several trials, the teacher may only touch the line, then over several trials the teacher may only point to the line from an increasing distance away. When the student puts the saw on the line without the tapping, touching or pointing, the gestural prompt is no longer needed.

Modelling

Modelling involves teaching by demonstration. A teacher demonstrates how a task is done and the student is expected to imitate (do the task in the same way). Modelling may be used as a prompt. When a student cannot perform a task following a request, the teacher may use a verbal, gestural, and/or a modelling prompt. Alternatively, modelling, usually used with verbal instruction, is a commonly used general method of teaching a broad variety of skills. In the discussion that follows, modelling is described both as a prompt and as a general method of teaching.

Rules for using and fading modelling

1. Get the student's attention before beginning to model.
2. Model slowly enough so that the student can see each part of the demonstration.
3. Focus the student's attention on important parts of the demonstration by labelling those parts. For example, rather than merely showing a student how to hold a pencil, point (a gestural prompt) to where the pencil rests on the hand between the thumb and the forefinger and say 'It touches here'. The teacher may later confirm that the student has seen the important features by asking the student to point to 'where the pencil touches'.
4. If a task involves a long series of steps, the demonstration may be divided into parts. The teacher may demonstrate the first five steps for the student to imitate several times. Then the teacher may model the next four steps. The student may then perform the first five steps followed by the next four steps. By imitating the entire sequence, the student practices earlier learning and joins it together in the right order with new learning. The number of steps that should be modelled at any one time depends on the difficulty of the task and the skills of the student.

5. Sometimes a task may be modelled several times before the learner is asked to imitate the teacher.
6. Sometimes it is important for the teacher to stand beside the student when modelling. For example, if a teacher stands in front of a student to demonstrate how to clean a fish and says 'hold onto the head up here and start cutting the fish here just below the head', some students may find it difficult to put their fish in the right position. For example, if the student makes his fish exactly like the teacher's fish, the student's fish will be up-side-down and facing in the wrong direction. This problem can be avoided by having the teacher do the demonstration while standing next to the student. Then the student should make his fish exactly like the teacher's fish. Sometimes it may also be better to stand behind the student and reach around.
7. Modelling is faded by using gestural and verbal prompts. After repeated demonstrations, the teacher does less and less modelling and more and more gesturing. Over several trials, these gestures and the verbal prompts are also faded until the learner is able to perform without any prompts.

Physical prompting

Physical prompting involves the teacher using his or her hands to move a student through a task. Physical prompting may be used when a blind student is being taught to use a loom.

The following steps may be followed:

1. Full physical guidance: initially the teacher puts her hands fully on top of the student's hands and moves the student's hands to help locate, direct, pass and catch the shuttle.
2. Partial physical guidance: over several trials the teacher slowly reduces the amount of guidance and offers only as much as is required, when it is required. For example, the teacher's hands follow the student's hands (shadowing) throughout the task and touch, push, or hold and guide the student only when and as required.
3. Shadowing is continued until the student does not require any assistance for several trials.

Physical prompting may be used for a broad variety of different types of students and tasks.

General rules for all types of prompting and fading

1. Only prompt (help) a student when help is required. Give only as much help as is necessary. Some teachers are too helpful and teach students to depend on teacher help when the students are capable of performing without help.
2. Always state the task request before giving the prompt. For example, when a student is being taught to scale a fish, before scaling each fish, the teacher should say 'Scale the fish'. After the request, the teacher can prompt the student to position the fish, hold the fish's tail, put the knife in the right position, and scrape the fish. The steps in the fish scraping task are listed below:
 - (a) The teacher gives the request, 'scale the fish'.
 - (b) Prompt: the teacher helps the student to position the fish.
 - (c) The student positions the fish.
 - (d) Prompt: the teacher helps the student to hold the fish's tail.
 - (e) The student holds the fish's tail.
 - (f) Prompt: the teacher helps the student to position the knife properly.
 - (g) The student positions the knife properly.
 - (h) Prompt: the teacher helps the student to scrape the fish with the knife.
 - (i) The student scrapes the fish with the knife.
 - (j) Repeat until the scales are gone.

The teacher wants the student to learn to scale fish after she says 'Scale the fish'. Initially, the student does not know how to scale fish. The student does not know what to do. The teacher uses verbal, gestural, modelling and/or physical prompts to help the student scale the fish. In the list above, the teacher gives the student the request, then she helps the student to do each step. Slowly the teacher fades the prompts. If the student requires the least help placing the knife, the teacher may fade (remove) that prompt first. When all of

the prompts have been removed, only the request is left. Since the request has always been stated before all of the fish scaling steps, the request will signal that it is time to do all the steps. When a request is always stated before each of the steps in a task, the request starts to act as a signal to do all of the steps in the task.

3. When a student needs help, try verbal prompting first. If unsuccessful, watch how the student behaves. Decide if gestural, modelling or physical prompts are required. When using gestures, models or physical help, use verbal prompts at the same time. Fade the verbal prompts last.
4. If a student cannot respond properly, use a prompt. Do not give more help than is needed. Over several steps fade (remove) as much of the prompt as possible as fast as possible. Be careful. If a prompt is faded before the student can act on his or her own, errors will happen. If a prompt is used longer than the student needs it, the student will learn to depend on unnecessary help. The student's development will be retarded.

Task analysis and teaching sequences

Task analysis

Task analysis is the process of analysing a task into its parts. Task analysis is used to find out what steps should be taught so that a student will learn to perform a task. In an example discussed earlier, fish scaling was task analysed. Five steps were found: (a) position the fish, (b) hold the fish by the tail, (c) position the knife, (d) scrape the fish, and (e) repeat until all the scales are gone. All of these steps must be performed in order to scale a fish. A chain is a set of steps that must be performed in order.

In the following example, the task of adding two numbers together is task analysed to find out what steps to teach the student.

Step 1. Define the task the teacher wants to teach.

$$4 + 3 = \underline{\quad}; \quad 6 + 9 = \underline{\quad}; \quad 2 + 0 = \underline{\quad}$$

The task is defined as: when the student is given any addition problem like the examples above having two single digit numbers (like four and nine) the student will write the sum of the digits in the space. When given any ten random

problems of this type, the student will get at least eight out of ten correct.

This task is defined in the form of an instructional objective. An instructional objective defines what a student is expected to be able to do at the end of instruction of a particular task:

- (a) The student will be able to (write the sum in the space) observable, measurable performance.
- (b) Under certain conditions (given any ten random problems with two single digit numbers).
- (c) To particular standards (get at least eight out of ten problems correct).

There are three parts to an instructional objective: the conditions (what is given to the student), the performance (what the student does is defined in observable, measurable behaviour, write), and the standards of performance.

Step 2. Do a performance analysis of the task. Find the easiest way to perform this task. A performance analysis is done in the following way:

- (a) Review teaching programmes and textbooks to identify the steps that are usually taught.
- (b) Carefully study the steps that skilled people follow. Record each step.
- (c) Carefully perform the task yourself. Record each step you take.
- (d) Study the different methods of performing the task. Find the simplest method. Sometimes a new and simpler method may have to be developed.
- (e) Analyse each step of the method to find the skills that are required.

For example the steps and skills required to find the sum of $4 + 7 = \underline{\quad}$ are:

STEP	SKILL
1. Read the + sign	Given a + sign between two numbers and the question, 'What does this mean?' the student

2. Read the first number

will say 'Add the two numbers'

Given any random number from 1 to 9, the student must be able to name the number

3. Read the second number

(Same as 2 above)

4. Add the second number to the first

Given any random number 1 to 9 the student will write the same number of tally marks e.g. given 5, the student will write ///// tallies

Given any random number of tallies from one to nine the student will be able to count the tallies

Given a random number from one to nine and any random number of tallies from one to nine, the student will state the first number and count and add the tallies to the first number. For example, in the above problem the student would start with four and count seven tallies to get the sum of eleven

Given verbally any random number from one to eighteen the student will be able to write the number

Given the question $4 + 7 = \underline{\hspace{1cm}}$, the student would write eleven over the mark.

Thus, task analysis identifies the steps needed to add problems like those defined in the instructional objective. Also, the analysis has shown the skills needed to perform these steps.

Given this information a teacher can develop a teaching sequence.

Teaching sequences

The steps and skills identified in the previous task analysis may be sequenced in the following order for teaching.

CONDITIONS GIVEN TO STUDENT	STUDENT RESPONSE
1. Given randomly any number from one to nine	read the number
2. Given sets of tallies for any number one to nine	count the tallies
3. Given visually any number from one to nine	read the number and write the correct number of tallies
4. Given verbally any number from one to nine	write the correct number
5. Given the + sign between two numbers and asked what it means	say 'Add the two numbers'
6. Given numbers in the form $4 + 3 = \underline{\quad}$	draw three tallies the three; say four, and count the three tallies while adding to the four: five, six, seven, and write seven in the <u> </u> space.

Note the order in which the skills have been sequenced. Skills are not always listed from simple to difficult. The simplest skill, reading the + sign has been listed as step 6 in the sequence. The skill is listed just before the step where the student will learn what 'add the two numbers means'. If the meaning of the + sign had been taught at step 1, the student may have forgotten its meaning by step 6. Note that step number three includes the skills taught in steps 1 and 2, read the numbers and

write the correct number of tallies. Step number six includes all of the previously learned skills.

When all of the necessary skills have been sequenced in the order in which they will be taught, the teacher must then select a suitable method of teaching each step. The previously described 'attention, model, prompt and test' method of teaching and methods of prompting may be used to teach these skills.

In the following example the teaching and prompting methods are used to teach step 3, 'given randomly any number from one to nine, the student will read the number and write the correct number of tallies'.

Write a single random number from one to nine on the blackboard:

- | | |
|--|---|
| 1. Get students <u>attention</u> | 'Manji (student's name)
look at the board' |
| 2. Focus <u>attention</u> gestural
prompt | 'Look at this number'
(teacher points to the
number) |
| 3. <u>Model</u> the response | 'This number is four; I
will write four tal-
lies; one, two, three,
four'

Erase the tallies |
| 4. Repeat focus and model | 'Again, this number is
(pause) four, I will
write (pause) four
tallies'

Erase the tallies |
| 5. Request | 'What number is this?'
(four); 'How many tal-
lies should I write?'
(four). 'Count the
tallies with me' |
| 6. <u>Prompt</u> | (Use a leading prompt;
the teacher counts each
tally with the students
as it is written) 'one,
two, three, four'

Erase the tallies |

7. Repeat request and prompt
(optional)

(Repeat step 7 two, three or more times until the students respond rapidly, consistently and accurately)

8. Test

(Repeat step 7 without the lead prompt)

9. Reward or correct

'Good counting'

Continue the teaching sequence in the following manner. Put two numbers on the board, the number previously taught, four, and a new random number, e.g. seven. Use the teaching sequence again. Read the number four, write four tallies and erase. Read the number seven, write seven tallies and erase. Do steps 5 and 6 with number four. Do steps 5 and 6 with number seven.

Again, repeat the teaching sequence with three numbers: four, seven and five. Then repeat the sequence with numbers seven, five, and three, eliminate four from review. When the next number is added, eliminate the seven from review. Later, after several numbers have been learned review the four and the seven again.

Shaping

In the previous example, the student was first given one number to work with, then two numbers, then three numbers. The first step was easy to learn. Later steps became more and more difficult. This method of teaching is called shaping.

With shaping, a student's behaviour is changed more and more over several stages. Over several steps, the student's behaviour may be increased or decreased. In the above example, the student's ability to work with more numbers was increased over several steps.

In a pre-school in India, Puhan cried each day when he was brought to school. Some days he would cry for more than an hour after his arrival. The more attention that was given to him, the more he cried. He usually stopped crying after one hour. The teacher used shaping to get him to stop crying. She put a piece of paper on the large clock and said when this hand (the hour hand) reaches this paper (one hour after arrival) if you have stopped crying you will get a candy. During the hour, Puhan was treated like the other children. No one paid attention to his crying. Several times the teacher said, 'where is the hand?' looked at Puhan and went away. At the end of the hour, the teacher drew attention to the clock, if the boy had stopped crying, as he usually did, the teacher gave him the candy, praised him for not crying, and played a game with him. If Puhan had not stopped crying, the teacher gave the candy to another child who

was not crying. No attention was paid to Puhān. After two more days the paper on the clock was moved to 45 minutes. After two days the paper was moved to 30 minutes. Over several more days the paper was moved to 20, ten and five minutes after Puhān's arrival. Then for several days he was met at the door with a candy. One day he was not given a candy. Then for two days he was not given a candy. Then use of the candies was stopped. This example of shaping shows a behaviour (crying) being slowly decreased over several steps.

In the example that follows shaping is used to increase a behaviour. Jonas was a lazy boy. Usually, he would not do more than two or three addition and subtraction problems in 1/2 hour. His teacher used shaping. She said to him, 'If you get three problems correct in this 1/2 hour, you can sit at the teacher's table to work for the rest of the morning (his reward).' Then after two days she said, 'If you get six problems correct in this half hour, you can sit at my table to work'. 'Over two weeks, the number of problems Jonas did in a 1/2 hour was increased to 20.'

A blind child learning to walk without help through a crowded market may first be taught to walk with assistance through a small then large group of friends. Then the child may be helped to walk through a familiar market with few people, then with many people. Later, she may be taken to an unfamiliar market to walk without help.

If a teacher can make a large change in a student's behaviour simply by telling the student what to do, or by prompting the student to change, shaping is not needed. If a large change in behaviour must be made in small steps, shaping is very useful. Shaping is often useful with handicapped students. To use shaping well, follow the steps listed below:

1. Make the first step easy. Ask the student to do what he or she is already able to do.
2. Reward the student for doing what she or he is already able to do.
3. Repeat steps one and two several times then ask the student to make a small change in behaviour. The change should be one that the student is able to make. If the change is too big the student may not be able to make it and problems will develop.
4. Reward the student each time she or he makes the small change.
5. After the small changes have been made several times, ask the student to make an additional small change. Make the

change as big as possible (make the student improve as much as he is able) but be careful, make the change as small as necessary. Do not ask the learner to grow more in one step than she or he is capable. If you do ask him or her to make a change that is too big, move back to an earlier step and after several trials, ask for a smaller change than before.

6. Sometimes the teacher may use prompts to help a learner make the changes at each step.
7. Reward the student each time he or she makes the small change.

Rewards

Many people do long and hard tasks in the hot sun every day. They do things like plowing and digging, planting, carrying water, and picking and carrying crops. There is no one in the field giving them rewards because they did their job. They seem to do these tasks because it is their job.

Are these people rewarded for doing their work? Yes! Because they work, they get food or pay. With the food they and their family eat. Would they continue to work if they were not rewarded? No! If they did not get food or pay, they would not continue to work in the fields. People work because they get rewards. Sometimes the reward is not immediate or direct.

Students work for rewards. Sometimes the reward is distant. The student believes that if he is successful in school he will get a better job. Some students are rewarded by their parents for getting good marks. Some students find school very difficult. They do not get good marks. They do not think they will get better jobs. They do not want to work in school because they do not get rewarded. Some handicapped students are like this.

When a handicapped student finds school difficult, when she or he fails, and is not rewarded, the student may quit trying to be successful. If a teacher wants this student to work harder doing a task the student does not want to do, the teacher will have to follow the steps listed below:

1. Use shaping. Ask the student to do what he can already do.
2. Use rewards. Give the student a reward for trying to perform the task.
3. Use shaping to help the student be successful.
4. Reward the student for being successful.

5. Later, when the student has been successful and when she or he has been taught that he will benefit from learning, the teacher may stop giving a reward. The student will continue to work because he will see the eventual rewards of his or her work.

What rewards can a teacher give to a student? A reward is something that a particular student will work to get. Some students will work very hard if a teacher smiles at them. The smile is a reward. The same smile may not reward another student. A student may do one task for a smile but may not do another task for a smile. If a teacher wants to reward a student for his work, the teacher must consider both the student and the task. The age of the student is an important consideration. What is rewarding in one culture may not be rewarding in another. Some things a teacher may give students are listed below. Teachers will have to test if these things are rewards - do they increase student effort:

1. Verbal praise. Describe what the student did well. Say things like, 'I am proud of you, you got four correct answers'. 'Good work, your printing is neat'. 'Good, your weaving is tight'. Use a variety of verbal praise, do not always say the same thing.
2. Special privileges. A student who performs well may be allowed to work at the teacher's table for a short time, sit for an hour in a special chair reserved for students who are working hard, or supervise or help younger students when they are working. The student may also be allowed to listen to a radio, play with a special toy, read a special book or work on a craft. The student may be given a special hat to wear for the morning, be permitted to eat lunch with the teacher, or draw on the blackboard. The student may be given extra paper or material for a craft project.
3. Social praise. When a student performs well the teacher may shake the student's hand, nod and smile while giving verbal praise, or touch the student's shoulder. Often when a student performs poorly, a teacher will spend time talking to the student. The teacher's attention may increase the student's poor behaviour. Give teacher attention only to students who try hard or who show improvement. When a student performs well, a teacher may spend five minutes talking to the student about his interests.
4. Food rewards. When a student tries to perform well or improve even a small amount, the teacher may give the student part of a banana, some peanuts, some water or tea to drink. Many other things may be rewarding to different students, at different ages, in different cultures, at

different times and tasks. Groups of teachers should discuss what might be rewarding for their students.

Rules for using rewards

1. Decide what you are going to reward. If you are using shaping, initially ask the student to do what she can already do. Later, increase the demands. Sometimes the teacher may wish to tell the student in advance what she will be rewarded for. Other times, the student may spontaneously perform a desired behaviour that the teacher has not discussed. This behaviour should be heavily rewarded. It is desirable that the student perform well without the promise of a teacher reward.
2. Give the rewards to the student as soon as possible following the desired behaviour.
3. Whenever a student is rewarded, use descriptive praise. For example, say, 'I am rewarding you because, you read the sentence with only two mistakes.' 'Good, you got one more addition question right than the last time; you are improving.' 'Excellent, although you did not improve, you tried very hard; trying hard is important'. Give rewards both for improving and for trying to improve.
4. Occasionally when a student is learning a new skill tell him why the skill is important. For example, if a student is learning to write clearly, tell him that clear writing will make it easier for him to communicate with other people. Demonstrate the results of the improvement. Take the student to another teacher and ask the teacher to read the student's note. 'You see, when your writing is clear you can leave, Mrs Mishra a note'. The attention the child receives will reward his behaviour. Furthermore, the child is being taught the natural rewards of his improvement. As a result, he will learn to write clearly without teacher rewards.
5. When a student is first being taught a new skill, or when a new attempt is being made to either increase or decrease a behaviour, reward the student often. In the early stages, 80 per cent of the student's correct behaviour should be rewarded. Frequent rewards help to establish initial changes of behaviour.
6. After the changes have been established, slowly reduce the amount of the reward. For example, reward only 75 per cent of the correct responses. Make it unpredictable so that the student does not know when she will be rewarded. Then reduce the rewards until only 50 per cent of the

student's correct behaviours are being rewarded. Continue to decrease the rewards until the student learns to perform without the teacher rewards. Reducing the rewards in this manner will make the student's new behaviour strong and durable. When the teacher observes the student's behaviour she will know when to reduce the reward and by how much to make the reduction. When a student begins to perform a new behaviour rapidly, consistently and accurately, reduce the reward as much as possible, (and as little as necessary) while maintaining a rapid, accurate and consistent response.

7. Use a variety of different kinds of rewards with each student. The more any one reward is used, the more its value as a reward is reduced. For example, a hungry man will work long and hard for a food reward. The more food he gets, the more rapidly he will become full. When he is full, the food will no longer be a reward. It may become a punishment. Therefore, it is important to use a variety of different types of rewards. Also, it is important to give a student only a small amount of any one reward at any one time. Only give as much reward as is necessary to get the student to work hard. Sometimes, if a student does something special without being asked, give her a big reward. Whatever is being used as a reward it should be made available to the student only for desired behaviour. If the reward is available for other things its value as a reward for appropriate behaviour will be reduced.

Practice

How often should a skill be practised? If a student is taught a new skill one morning and cannot perform the skill the next afternoon, the students may not have practised the skill often enough. For example, on the first day if the student had practised the skill in the morning, briefly practised again in the afternoon, and again briefly practised the next morning, he would have been able to perform on the afternoon of the second day. To maintain a student's learning, practise the skill often at different times as the skill becomes established (the student can act rapidly, consistently, and accurately) practise the skill less and less often. If the student's behaviour is maintained, practise less often. If the student's behaviour is not maintained, practise more often. Monitor the student's behaviour to determine how often to practise a skill.

When new skills are not being taught, practise skills already taught. Review skills in the following order:

1. Review first, skills that have had a high error rate.

2. Next in priority, review recently learned skills that may not be well established
3. Finally, review skills that have not been recently practised.

How long should a skill be practised at any one time? When a student first begins to practise a skill, performance may be slow, inconsistent and inaccurate. It may take time for the student to 'warm-up' to perform as well as she is able. A practice session should be long enough for a student to warm-up and to improve her skill. After a student performs a skill for a long period of time, the student may become tired and bored. At this point the student may not pay attention to the task, may not try hard enough and may make more errors. The student may learn not to like the task. If practice stops after a student begins to make mistakes, the student may be rewarded for making mistakes. Practice should stop before the student begins making mistakes. Then the student is rewarded for performing well. Monitor each student's performance to determine how long to practise each skill.